Earth & Environmental Sciences Division

News, Views & EEScience

Disclaimer: this monthly update is intended for internal distribution within the Earth and Environmental Sciences Division at Los Alamos National Laboratory and must not be distributed outside of LANL.

Safety

ERGONOMICS, ERGONOMICS

NEUTRAL POSITION!

NEW – LANL Computer-Based ERGONOMIC Self Assessment

A Message from Jeff

Jeff Hansen, Division ES&H Officer, 667-5043, jchansen@lanl.gov

We now have access to a computer-based ergonomics self assessment that takes less than 20 minutes to assess your current configuration and assist you in making necessary adjustments to create your own "NEUTRAL POSITION." We are currently in the process of linking from our Division's safety web page http://ees5db.lanl.gov/eesdo/doclosed_access/safety/index.html
with the directions for you to directly link to the url and how to sign into the system. If you want to do the assessment sooner, go to http://workwell.remedyint.com/lanl
and use access code ergolanl. I encourage everyone to take a few minutes and go through this important assessment.

More on Safety

Note from Paul: Ergonomic issues constitute the most frequent cause of work-related health issues in EES. I took this self-assessment and made some changes to my workspace. I encourage you to do the same!

Security

An Ear on the LIR from Tony

Tony Montoya, Acting Division Security Officer (DSO), 7-8065, antonio@lanl.gov.

ACCORDING TO THE LIR - Security Badges:

By wearing your LANL Security badge in public (other than Laboratory property) you are in violation of the LANL General Security LIR, Attachment 7, Section 3.1. Please remove your badge and place it in a non-visible location while off Laboratory property.

More on Security Clearances

Security clearances: with excellent work by Debbie Pirkl, EES-DO, we have snared 29 slots for Q-clearances and 6 L-clearances for our Division. This is a major step toward ensuring that all of our US Citizen employees will be ready to contribute to certain parts of the National Security Mission as opportunities arise. My thanks also to the applicants who moved on a quick time-line to fill in and submit those lengthy Personnel Security Questionnaires.

EES Organizational News

Ardyth Simmons, the new EES Program Manager for Repository Science arrived this month. She is located in TA-3/215, room 233, e-mail: asimmons@lanl.gov, and phone number is 665-3935. Please join me in welcoming Ardyth to EES!

Program Notes

I continue to hold fortnightly meetings with all of our program managers and portfolio

leaders, including: Paul Dixon, Ardyth Simmons, Ned Elkins, George Guthrie, Gary Geernaert, Everett Springer, Jim Albright, Jim Aldrich, Naomi Becker, Jim Bossert, C L Edwards, Larry Jones, Greg Valentine, and Wendee Brunish. This is an opportunity for us to share information and compare notes. If you have not talked to your favorite program manager lately, and you would like to be up-to-date on what's happening in that realm, feel free to call on them or you may access them on the EES Web @ http://www.ees.lanl.gov/Programs/contacts.shtml

Recent topics of discussion in the program area have included:

Re-planning of the Yucca Mountain project to meet 12/04 License Application;

Proposals for regional partnerships in carbon dioxide sequestration;

Possible new initiative in oil and gas (perhaps focused on micro drilling and on methane clathrates);

Nuclear / Hydrogen economy and implications for fossil fuels;

National Climate Change Initiative opportunities (up to $40M may be available nationally);

Continued work with stakeholders on the water initiatives;

New capability for the Atmospheric Radiation Measurement Program;

Request for expression of interest for engineering work for waste management;

Homeland defense applications (mostly in rad. / nuclear and chem. / bio.);

Requests for possible help with aspects of the war; and more.

Travel Notes

On 18 March I was in Santa Fe at the annual Hydrogeologic Characterization meeting – the formal part of the meeting was a series of presentations and discussions with the New Mexico Environment Department, with a later poster session for the public. Dave Broxton, Pat Longmire, Bill Stone, and Bruce Robinson, EES-6, all did a fine job of representing the science done for this program in EES Division (analysis on wells, aqueous geochemistry, hydrogeologic modeling). Kudos also to Charlie Nylander of RRES, the leader of this activity, for coordinating the meeting, and to Bruce Robinson, Team Leader of the Subsurface Flow and Transport Team in EE-6, for coordinating the posters. An article featuring Pat Longmire talking about perchlorate measurements also appeared in the Newsbulletin: http://www.lanl.gov/orgs/pa/newsbulletin/2003/03/20/

Jobs Openings

The EES-7 Group Leader advertisements have attracted twenty applicants, and we are proceeding to an evaluation of the applications by a committee chaired by Greg Valentine, EES-6 Group Leader. The ad. number is 203946 and can be reached @ http://www.hr.lanl.gov/JPS/regjobsearch.stm
It is still open as I write this publication.

The advertisement for the EES-2 Group Leader position should be on the Web by the time you read this missive. Again, we will use the typical hiring process for filling this position.

Update on Operations

Interim Director Nanos - Taking Steps Toward Improvement

Interim Director Pete Nanos is providing a great deal of information on Laboratory-wide improvements in operations, and I trust you are all keeping up. Within our Division, we have re-examined group operations, and we have a few budgetary changes (polite way of saying "tax increases") proposed for EES-6 and EES-7.

Buildings

We continue to push for new buildings for EES – and we continue to do well. Most recently, our case was presented (again) to the Senior Executive Team, and Pete Nanos requested a briefing package on Third Party Financing for him to carry to the University of California and to Washington, etc. No guarantees, of course.

News from the *S*cience and *E*ngineering *L*eadership *T*eam (SELT)

Dave Breshears, Chair,
5-2803, daveb@lanl.gov

During March, SELT focused on three activities. First, an electronic survey was developed and disseminated to obtain additional feedback from EES staff on business practices that negatively impact overall productivity. An analysis of the results is in progress. Second, the SELT began an evaluation of information relative to emerging Homeland Security programs. This process is expected to continue into the coming months. Third, nomination procedures were determined and disseminated within the division for new SELT membership to begin in late April. The terms for several of the SELT members will expire at that time.

News from the Computer Team

Lynn McDonald, Team Leader
7-1582, lmcdonald@lanl.gov

Lambda is here

EES Division has built a large Linux cluster (Lambda) that is managed for us by CCN-7. We recently purchased an upgrade for the machine and it is now complete and ready for use. We more than doubled the size, adding 91 new nodes, each with dual 1.4GHz processors and 4GB of memory. Several other organizations helped to purchase this recent upgrade, but EES still has a guaranteed share of 75 percent of the machine, so this is a significant resource for us. If you don't have an account on lambda, you can request one at http://eesint.lanl.gov/support/Accounts/.

More information on lambda:
http://ees5db.lanl.gov/support/users/FAQ/view.lasso?id=70
or contact Lynn McDonald, Team Leader, EES Computing Service
lmcdonald@lanl.gov

Reminder: Use the Hot Links from the EES home page to quickly access the Computer Team and other EES Services.

Service Anniversaries Congratulations to the Following:

Dale Counce, EES-6 – 25 years
Hemi Kalia, EES-7 – 15 years

Weekly Highlights / Accomplishments sent to ADSR

Terry Wallace Named as New Deputy Division Leader of Earth and Environmental Sciences Division

Terry Wallace has been appointed as the new Deputy Division Leader for EES, effective 19 May 2003. Terry is currently a Professor of Geophysics at the University of Arizona in Tucson and he has also served as Director of the Southern Arizona Seismic Observatory (SASO) since 1992. Terry is a well-recognized and a distinguished seismologist with broad knowledge in geosciences. He has authored or co-authored more than 80 peer-reviewed publications in many areas of seismology and tectonics, including ground-based nuclear explosion monitoring, plate tectonics, regional structure, and forensic seismology. He is the co-author of Modern Global Seismology (Lay and Wallace), which is a very widely used textbook on seismology. In the past two years, he has given 20 invited talks and presentations. Terry has a Ph.D. in Geophysics from the California Institute of Technology.

France, Japan, Korea, Canada, Great Britain, and Others Tour WIPP

Richard Kovach of the Earth and Environmental Sciences Division's (EES) Yucca Mountain Project Group, conducted several tours in February for interested groups. Twenty-two individuals from the Institute of Internal Auditors including members from the City of Las Vegas, Clark, and Nye Counties, Nevada, toured on February 25.

On February 26, Richard Kovach toured 22 individuals from the Nuclear Energy Institute (NEI) Western Region, in addition, representatives from the Japan Nuclear Fuel Cycle Development Institute (JNC) were also part of the briefing. They included Yuzo Kiyono, Deputy Director, JNC, Yoichi Onuma, Director, Litigation Department/Sendai Legal Affairs Bureau, JNC, Shigemichi Saito, Counselor, Minister's Secretariat, Ministry of Justice, Christopher McVay, Policy Analyst, JNC, and Richard Spence, DOE, Office of Facility Operation, Director, Environmental Safety and Health.

On February 28, Richard Kovach and Bruce Reinert, Yucca Mountain Project Group, led a tour of 50 individuals from the Waste Management 03 Conference held in Tucson, AZ. These individuals traveled from Tucson specifically to tour Yucca Mountain. Approximately, half of the group was foreign nationals. An example of some of the attendees was: Louis Johnson, Program Manager, General Atomic Stewart Smith, Advisory Engineer, Bechtel Bettis, Inc., Annoh Akio, Engineer, Japan Atomic Energy Research Institute, Wang-kyu Choi, Principal Researcher, Korea Atomic Energy Institute, Denis Deroubaix, Senior Analyst, COGEMA (French Nuclear Fuel Co.), Mark Gardiner, Project Specialist, Atomic Energy of Canada, Ltd., Makoto Kikuchi, Chief Project Manager, Hitachi Ltd., Ian Streatfield, Nuclear Regulator, Environment Agency, Seietsu Takeda, Deputy Director, Japan Nuclear Cycle, Development Institute, Ian George, Remediation Project Manager, British Nuclear Fuel, ltd.

Japan Interested in Yucca Mountain

On March 4, Bruce Reinert, Earth and Environmental Sciences Division's Yucca Mountain Project, presented tours for three individuals from Japan Power/Electric Power Development Company (J-Power/EPDC) and the Development Bank of Japan: Atsushi Yoshida, Chief Representative, J-Power/EPDC Washington Office; Kimio Yamaka, Chief Representative, Development Bank of Japan, California Office; Kyohei Nakamura, Researcher, J-Power/EPDC; and Richard Spence, DOE, Office of Facility Operation, Director, Environmental Safety and Health.

The "tours" consist of a general briefing of the tunnel layout and experiments (both com-

pleted and ongoing). This occurs underground in a side drift from the main tunnel called an "alcove" that has been customized for tours (including maps/display) and it is about 200 yards underground). The group boarded a train and traveled about 1.5 miles further underground and observed one of the project's long-term tests and then returned to the surface.

Los Alamos Hydrologist's Book "Succeeds Admirably"

Dongxiao Zhang, of Los Alamos' Earth and Environmental Sciences Division, is one of the most active researchers in the area of stochastic sub-surface hydrology. The release of his Academic Press book in 2002, Stochastic Methods for Flow in Porous Media: Coping with Uncertainties, was recently reviewed by "Eos" the Transactions of the American Geophysical Union as, "succeeds admirably in presenting the material in as straightforward and reader-friendly a manner as possible, by illustrating the advantages and limitations of each technique to the problem at hand."

Traditional analyses of groundwater problems rely on solution of partial differential equations that require precise definition of parameters, water sources, and conditions at the boundaries of the hydrogeologic system. The combination of spatio-temporal variation, measurement error, and uncertainty has led the development of stochastic sub-surface hydrology. Zhang, according to the Eos Review, "surveys a broad range of approaches used by scientists in the sub-surface hydrologic community, and presents some of the most recent accomplishments in the development of stochastic methods."

Eos also states, "Perhaps the most important aspect offered by the book is the complete and authoritative manner with which the topics are covered, thus allowing stochastic sub-surface hydrology to claim that it has outgrown the research environment, and is ready for use by practicing hydrologists."

National Institute of Nuclear Research of Mexico Tours Los Alamos' GISLab

David Lizcano, a fellow of the International Atomic Energy Agency and from the National Institute of Nuclear Research of Mexico, toured Los Alamos National Laboratory's Geographic Information Systems Laboratory (GISLab) on March 5. Marc Witkowski of the Earth and Environmental Sciences Division met with David at GISLab where a tour of how GIS is used at Los Alamos and reviewed a variety of Los Alamos' hydrologic, geologic, and environmental characterization projects. David Lizcano's visit was part of the Sister Laboratory Program that is coordinated through the Laboratory's Nonproliferation and International Security Division.

Los Alamos Releases New Version of Computational Hydrology Code

Researchers in the Earth and Environmental Sciences Division (EES) recently released a major new version of the their computational Finite-Element and Heat-Mass (FEHM) transfer code. FEHM was originally developed at Los Alamos in the early 1980s to simulate geothermal and hot dry rock reservoirs. Today, the code is used at over 100 facilities to model a large variety of subsurface flow and contaminant transport problems. Version 2.20 is used on virtually all of the Laboratory's major programs involving hydrologic research; it builds on the long history of its innovative features that were developed over the last 15 years.

New capabilities in this version include: new Generalized Double Porosity Model (GDPM) solver; enhanced linear equation solvers; more general boundary condition options; particle tracking model enhancements, including new dispersion coefficient tensor formulations, reverse particle tracking, and particle capture at well bores; a new dual permeability particle-tracking model for the unsaturated zone; and

features that increase compatibility with MODFLOW models.

EES intends to continue pushing the forefront of computational hydrology with future versions of the code, and further the use of the code by the hydrologic community by distributing it, and providing technical support through user workshops and one-on-one interactions.

Environmental Systems Research Institute publishes Los Alamos' Maps

Thousands of Geographic Information Systems (GIS) users will now have access to three maps generated by the Earth and Environmental Sciences Division's Geographic Information Systems Laboratory (GISLab) and collaborators. Environmental Systems Research Institute (ESRI) is the leading GIS software producer in the world. The three GISLab maps of the 2000 Cerro Grande Fire, "First Fire, Then Flood," by Marcia A. Jones, Stephen G. McLin, Mark E. Van Eckhout, and Douglas E. Walther; "Cerro Grande Fire Progression from May 5 through May 18, 2000," and "Cerro Grande Fire Burn Severity," by Douglas E. Walther, were displayed at the ESRI 2002 user conference and recognized as "outstanding maps". All three maps will be published in ESRI's 2003 map book that is distributed to a worldwide audience.

Los Alamos Participates in First Geologic Sequestration Field Test in New Mexico

Researchers from the Earth and Environmental Sciences Division at Los Alamos National Laboratory and Sandia National Laboratories are experimenting in a first ever field-test project in Hobbs, New Mexico, that is sponsored by the US Department of Energy. Other collaborators on this project include Strata Production Company, New Mexico Institute of Mining and Technology, and Colorado School of Mines. The researchers are asking the question, "Can depleted oil fields offer sites for sequestering greenhouse gas emissions?"

As part of the project actual field injection of carbon dioxide was performed. Between December 20, 2002 and February 10, 2003, approximately 2,100 tons of carbon dioxide was injected into Strata Production Company's West Pearl Queen reservoir near Hobbs, which is comparable to a single day of emissions from an average coal-fired plant. The carbon dioxide "plume" is currently soaking into the depleted oil reservoir rock while the researchers are monitoring whether the gases are likely to stay within the formation and what physical, mineral, and chemical changes might occur in the geologic structures over the next year. In April, the researchers will perform a 3-D seismic survey and provide before and after pictures of the reservoir to begin determining the fate of the injected plume. In addition, data from the field tests and laboratory experiments will be used to determine the accuracy of several modeling and simulation tools that will be used to predict the storage capacity and physical or chemical effects of the carbon dioxide on the reservoir.

Awards and Recognition

Two of our eight LDRD/Directed Research pre-proposals were selected to proceed to the full proposal stage. They are:

Don Zhang, et al., EES-6: "Science of geological carbon sequestration: integration of experimentation and simulation; "

Manvendra Dubey et al., EES-6:"Resolving the aerosol – climate-water puzzle: science for regional stability and security."

Congratulations to these two teams, who are now working hard to prepare the proposals. Thanks to all of the contributors of our pre-proposals and to the SELT for their help in bringing the best ideas to the pre-proposal

stage: in my opinion, the quality of the pre-proposals is significantly improved from last year.

Kudos for LIDAR work: Interim Director Pete Nanos received a letter from John W. Keys, III, Commissioner of the US Department of the Interior, recognizing excellent work being done at Sandia and Los Alamos. Specifically, Commissioner Keys noted the RAMAN LIDAR work done by Dan Cooper, EES-2 and colleagues, stating, *inter alia*: "Their measurements of water exchange in the Bosque Del Apache and Elephant Butte is a pioneering technology that has been used as a primary tool to validate the "ET tool box" as part of the Bureau of Reclamation's effort to manage our water resources in New Mexico." Well-done!

Dottie's Mystery Image:

Winners of the February Mystery Image: It was WIPP!

1st Place: James Young, EES-9

2nd Place: David Guerin, EES-12

3rd Place: Peter Roberts, EES-11

4th Place: Frank Perry, EES-9

EES-9 is now in First Place!

It's a Mystery what the prize will be!

*M*ystery Image for March (above): is this

- *Volcanic cone near Grants, NM?*
- *Lathrop Wells Cone, Nevada?*
- *South Santa Fe sand, gravel plant?*

Respond to: dot@lanl.gov?

EEScience

Guest Editorial

New Version of FEHM Released

George Zyvoloski, EES-6
gaz@lanl.gov
Bruce Robinson, EES-6
robinson@lanl.gov

Members of the Hydrology, Geochemistry, and Geology Group's (EES-6) Subsurface Flow and Transport Team recently released a major new version of the their computational Finite-Element and Heat-Mass (FEHM) transfer code. FEHM was originally developed at

Los Alamos in the early 1980s to simulate geothermal and hot dry rock reservoirs. Today, the code is used at over 100 facilities to model a large variety of subsurface flow and contaminant transport problems. Version 2.20 is used on virtually all of the Laboratory's major programs involving hydrologic research; it builds on the long history of its innovative features that were developed over the last 15 years. New capabilities in this version include: new Generalized Double Porosity Model (GDPM) solver; enhanced linear equation solvers; more general boundary condition options; particle tracking model enhancements, including new dispersion coefficient tensor formulations, reverse particle tracking, and particle capture at well bores; a new dual permeability particle-tracking model for the unsaturated zone; and features that increase compatibility with MODFLOW models.

The code was developed under the quality assurance procedures of the Yucca Mountain Project (YMP), which includes rigorous documentation, configuration management, and testing. The team is to be congratulated for traversing this complex set of procedures, and meeting a critical deliverable deadline for YMP. The new version of FEHM will now be used in quality-affecting analyses for the saturated zone, unsaturated zone, and total system performance assessment. These studies form the scientific basis for much of the numerical modeling of the natural system being performed in support of the Project's License Application. The FEHM team consists of the following staff:

Overall head of Documentation, Testing, and QA: Zora Dash

Developers: George Zyvoloski, Bruce Robinson, Sharad Kelkar, Hari Viswanathan, Peng-Hsiang Tseng, Chunhong Li (Framatome ANP)

Testing, Review, QA: Rajesh Pawar, Terry Miller, Kay Birdsell, Phil Stauffer, and Brad Gundlach

Team members, Elizabeth Keating and Velimir Vesselinov, are using 3-D numerical models to study sustainability of groundwater resources in the region. We are also studying the potential impact of previous and current Laboratory activities on the subsurface environment and on groundwater quality and quantity. An example of the unique capabilities in using the code as applied to the Española Basin aquifer is shown in figure 1.

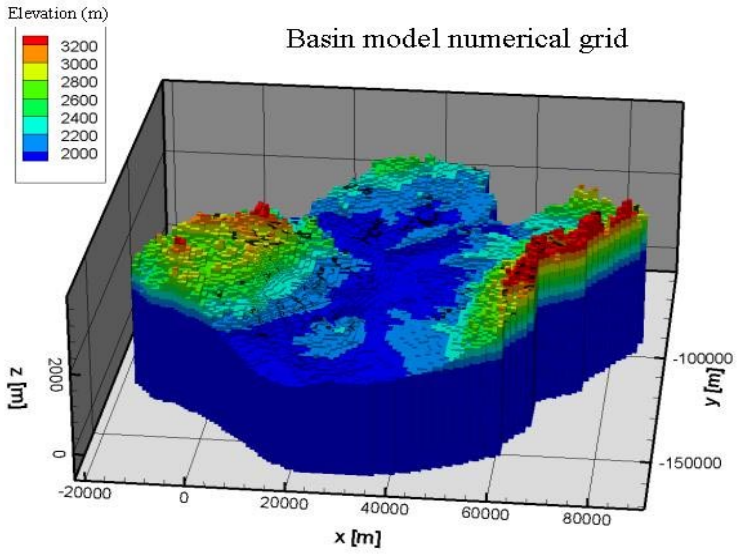

Fig. 1. Computational grid showing local basin topography (courtesy of Keating and Vesselinov).

In addition, virtually all of the EES-6 Subsurface Flow and Transport team has pushed the continual development of the code by performing more and more complex analyses as code users, providing programmatic funding

for code enhancements and helping find and fix bugs that surface as the code is used on real applications. **EES intends to continue pushing the forefront of computational hydrology with future versions of the code**, and further the use of the code by the hydrologic community by distributing it, and providing technical support through user workshops and one-on-one interactions.

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